TRANSIMS Version 1.1

Volume Two

Networks and Vehicles

LA-UR-00-1724

Disclaimer

These archived, draft documents describe TRANSIMS, Version 1.1, covered by the university research license. However, note that the documentation may be incomplete in some areas because of the ongoing TRANSIMS development. More recent documentation (for example, Version 2.0) may provide additional updated descriptions for Version 1.1, but also covers code changes beyond Version 1.1.

1. NETWORK FILES

The TRANSIMS Network representation provides detailed information about streets, intersections, signals, and transit in a road network. This section discusses the concepts involved in describing a road network and the TRANSIMS data table formats.

1.1 File Format

This section specifies the formats for the 18 data tables required to describe a TRANSIMS road network. Table 1 shows how the tables depend on one another. The units of measurement are SI units (i.e., distances in meters, time in seconds, etc.). Geographic coordinates are specified in the UTM system.

Table 1. Interdependencies between network tables.

Table	Tables on which it depends
Link	Node
Speed	Node, Link, Pocket Lane
Pocket Lane	Node, Link
Lane Use	Node, Link, Pocket Lane
Parking	Node, Link
Barrier	Node, Link, Pocket Lane
Transit Stop	Node, Link
Lane Connectivity	Node, Link, Pocket Lane
Turn Prohibition	Node, Link, Pocket Lane
Unsignalized Node	Node, Link, Pocket Lane
Signalized Node	Node, Timing Plan
Phasing Plan	Node, Link, Pocket Lane, Timing Plan
Detector	Node, Link, Pocket Lane
Signal Coordinator	Node, Signalized Node
Activity Location	Node, Link
Process Link	Parking, Transit Stop, Activity Location
Study Area Link	Link

The TRANSIMS software architecture allows for the inclusion of additional columns desired by an analyst, so the specification below gives only the required columns. The format for data files is ASCII, with columns delimited by tab characters; records are terminated by a new-line character (i.e., ISO format). The first line of the file must contain the field names (i.e., column headings) delimited by tab characters.

1.1.1 Node Table

Table 2 specifies the format for the node table. To validate a node table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.

- The IDs are unique.
- No nodes have the same easting, northing, and elevation. Also acceptable are nodes with the same easting and northing, but different elevations.

Table 2. Node table format.

Column Name	Description	Allowed Values
ID	ID number of the node.	integer: 1 through 2,147,483,647
EASTING	The x-coordinate of the node (in meters, UTM coordinate system).	floating-point number
NORTHING	The y-coordinate of the node (in meters, UTM coordinate system).	floating-point number
ELEVATION	The z-coordinate of the node (in meters, UTM coordinate system).	floating-point number
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.2 Link Table

Table 3 specifies the format for the link table. To validate a link table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The IDs are unique.
- The nodes at the endpoints exist.
- There are different nodes at the endpoints.
- There are permanent lanes in at least one direction.
- There is at least one permanent lane in every direction that there is a pocket lane.
- The length of the link is at least as great as the distance between its endpoints.
- The length of the link is not far greater (e.g., 50% more) than the distance between its endpoints.
- The length of the link is not exceedingly small. (The Traffic Microsimulator may have difficulty simulating successive links that are less than 50 meters long.)
- The sum of the setback lengths is less than the length of the link.
- All nodes have at least one incoming and one outgoing link.
- At least some types of vehicles are allowed on the link.
- The functional classes of all the links connected to a node are consistent: Table 4 lists functional classes for links. First, divide the TRANSIMS functional classes into three

categories:

1) restricted—Freeway, Expressway
2) surface—Primary Arterial, Secondary Arterial, Frontage Road, Collector, Local Street, Zonal Connector, Other, Ferry, Walkway
3) miscellaneous—Ramp, Bikeway, Busway, Light Rail, Heavy Rail.

There are inconsistent functional classes if there is a mixture of "restricted" and "surface" links at a node. (This notion can probably be refined further.)

- The network graph is fully connected (i.e., one can reach any node from any other node).
- The network does not contain modal "sources" or "sinks." A modal source (sink) is a node that vehicles of a particular type can leave (enter), but cannot enter (leave).
- The network does not contain unwanted modal "islands." A modal island consists of a set of links for a particular type of vehicle that is disconnected from the rest of the links for that type of vehicle. (There may be some cases, such as for transit routes, where modal islands are desirable.)

Table 3. Link table format.

Column Name	Description	Allowed Values
ID	ID number of the link.	integer: 1 through 2,147,483,647
NAME	Name of street.	50 characters
NODEA	ID number of the node at A.	integer: 1 through 2,147,483,647
NODEB	ID number of the node at B.	integer: 1 through 2,147,483,647
PERMLANESA	Number of lanes on the link heading toward node A, not including pocket lanes.	integer: 0 through 255
PERMLANESB	Number of lanes on the link heading toward node B, not including pocket lanes.	integer: 0 through 255
LEFTPCKTSA	Number of pocket lanes to the left of the permanent lanes heading toward node A.	integer: 0 through 255
LEFTPCKTSB	Number of pocket lanes to the left of the permanent lanes heading toward node B.	integer: 0 through 255
RGHTPCKTSA	Number of pocket lanes to the right of the permanent lanes heading toward node A.	integer: 0 through 255
RGHTPCKTSB	Number of pocket lanes to the right of the permanent lanes heading toward node B.	integer: 0 through 255
TWOWAYTURN	Whether there is a two-way left-turn lane in the center of the link.	one character: F = false/no T = true/yes
LENGTH	Length of the link (in meters).	positive floating-point number

Column Name	Description	Allowed Values
GRADE	Percentage grade from node A to node B (uphill being a positive number).	floating-point number between –100 and +100
SETBACKA	Setback distance (in meters) from the center of the intersection at node A.	non-negative floating-point number
SETBACKB	Setback distance (in meters) from the center of the intersection at node B.	non-negative floating-point number
CAPACITYA	Total capacity (in vehicles per hour) for the lanes traveling to node A. This field is obsolete and its value is ignored—it will be deleted in a future TRANSIMS release.	non-negative floating-point number
CAPACITYB	Total capacity (in vehicles per hour) for the lanes traveling to node B. This field is obsolete and its value is ignored—it will be deleted in a future TRANSIMS release.	non-negative floating-point number
SPEEDLMTA	Default speed limit (in meters per second) for vehicles traveling toward node A.	positive floating-point number
SPEEDLMTB	Default speed limit (in meters per second) for vehicles traveling toward node B.	positive floating-point number
FREESPDA	Default free-flow speed (in meters per second) for vehicles traveling toward node A.	positive floating-point number
FREESPDB	Default free-flow speed (in meters per second) for vehicles traveling toward node B.	positive floating-point number
FUNCTCLASS	Functional class of the link. A link that permits both road and rail traffic should be coded with the roadway class.	ten characters: FREEWAY = freeway XPRESSWAY = expressway PRIARTER = primary arterial SECARTER = secondary arterial FRONTAGE = frontage road COLLECTOR = collector LOCAL = local street RAMP = freeway ramp ZONECONN = zonal connector OTHER = other WALKWAY = walk only BIKEWAY = bicycle only BUSWAY = bus only roadway LIGHTRAIL = light rail only HEAVYRAIL = heavy rail FERRY = ferry

Column Name	Description	Allowed Values
THRUA	Default through link connected at node A. A zero indicates there is no through link.	integer: 0 through 2,147,483,647
THRUB	Default through link connected at node B. A zero indicates there is no through link.	integer: 0 through 2,147,483,647
COLOR	The color number for the link (all of the links connected to a given link must have different colors). This field is obsolete and its value is ignored—it will be deleted in a future TRANSIMS release.	integer: 1 through 63
VEHICLE	Vehicle types (modes) allowed for use this link.	string of characters separated by slashes: WALK = walking allowed AUTO = private auto TRUCK = motor carrier BICYCLE = bicycle TAXI = paratransit BUS = bus TROLLEY = trolley STREETCAR = streetcar LIGHTRAIL = light rail transit RAPIDRAIL = rail rapid transit REGIONRAIL = regional rail
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

Table 4. Functional classes for links.

Name	Interpretation
Freeway	A divided, arterial highway for through traffic with full control of access. Full access control means the authority to control access is exercised to • give preference to through traffic by providing access connections with selected public roads • but prohibiting grade crossings and/or direct private driveway connections.
Expressway	A divided, arterial highway for through traffic with partial control of access. Partial control of access means that some authority is exercised to control access in the manner described above, but there are crossings at grade or direct private driveway connections.
Primary Arterial	A major arterial roadway with intersections at grade crossings and direct access to abutting property and on which geometric design and traffic-control measures are used to expedite safe movement of through traffic.

Name	Interpretation
Secondary Arterial	A minor arterial roadway with intersections at grade crossings and direct access to abutting property and on which geometric design and traffic-control measures are used to expedite safe movement of through traffic.
Frontage Road	An arterial that runs parallel to a freeway or expressway.
Collector Street	A roadway on which vehicular traffic is given preferential right of way. These streets have entrances to which vehicular traffic from intersecting roadways is required by law to yield right-of-way to vehicles as a result of either a stop sign or a yield sign (when such signs are erected).
Local Street	A street or road primarily used to access residence, business, or other abutting property.
Freeway Ramp	A unidirectional roadway that connects a freeway or expressway to an arterial.
Zonal Connector	An imaginary (non-physical) connection to or from the centroid of a traffic analysis zone.
Other	Any roadway not fitting the above definitions.
Walkway	A street restricted to use by pedestrians.
Busway	A street restricted to use by buses.
Light Rail	A roadbed restricted to use by light rail cars.
Heavy Rail	A roadbed restricted to use by heavy rail cars.
Ferry	A waterway crossed by ferry.

1.1.3 Speed Table

Entries in the speed table are required only when the speed limit or free speed for a link varies for different types of vehicles allowed to use the link. The speeds that appear in the Link Tables are used as defaults for any vehicle types not specified in a record in the Speed Table.

Table 5 specifies the format for the speed table. To validate a speed table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The node and link references are correct.
- The vehicle types are consistent with the vehicle types allowed on the link.

Table 5. Speed table format.

Column Name	Description	Allowed Values
`LINK`	ID number of the link with multiple speeds.	integer: 1 through 2,147,483,647
`NODE`	ID number of the node toward which lanes are headed.	integer: 1 through 2,147,483,647
`SPEEDLMT`	Speed limit (in meters per second) for vehicles.	positive floating-point number

Column Name	Description	Allowed Values
FREESPD	Free-flow speed (in meters per second) for vehicles.	positive floating-point number
VEHICLE	Vehicle type(s) to which speeds apply.	string of characters separated by slashes: AUTO = private auto TRUCK = motor carrier BICYCLE = bicycle TAXI = paratransit BUS = bus TROLLEY = trolley STREETCAR = streetcar LIGHTRAIL = light-rail transit RAPIDRAIL = rail-rapid transit REGIONRAIL = regional rail
STARTTIME	Starting time for the speeds. This field is ignored in the current TRANSIMS release—current tables should not include records depending on the STARTTIME/ENDTIME fields.	a character string with the day of week: SUN = Sunday MON = Monday TUE = Tuesday WED = Wednesday THU = Thursday FRI = Friday SAT = Saturday WKE = any weekend day WKD = any weekday ALL = any day The day is followed by the time of day (on a 24-hour clock). For example, WKD13:20 is any weekday at 1:20 in the afternoon.
ENDTIME	Ending time for the speeds. This field is ignored in the current TRANSIMS release—current tables should not include records depending on the STARTTIME/ENDTIME fields.	specified like STARTTIME
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.4 Pocket Lane Table

Table 6 specifies the format for the pocket lane table. To validate a pocket lane table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.

- The IDs are unique.
- The node and link references are correct.
- The lane number is that of a valid pocket lane.
- The offset and length are consistent with the setbacks and length of the link.
- None of the pockets overlap.
- All of the pocket lanes specified in the link table are present.

Table 6. Pocket lane table format.

Column Name	Description	Allowed Values
ID	ID number of the pocket lane.	integer: 1 through 2,147,483,647
NODE	ID number of the node toward which the pocket lane leads.	integer: 1 through 2,147,483,647
LINK	ID number of the link on which the pocket lane lies.	integer: 1 through 2,147,483,647
OFFSET	Starting position of the pocket lane, measured (in meters) from NODE (applicable to pullout pockets only).	non-negative floating-point number
LANE	Lane number of the pocket lane.	integer: 1 through 255
STYLE	Type of the pocket lane.	one character: T = turn pocket P = pull-out pocket M = merge pocket
LENGTH	Length of the pocket lane (in meters). Turn and merge pockets always start or end at the appropriate limit line.	positive floating-point number
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.5 Lane-use Table

Entries in the lane-use table are required only when a lane has restrictions for certain vehicle types. The vehicle types specified in the Link Table are permitted unrestricted use of all lanes on the link when there is no record in the lane-use table.

Table 7 specifies the format for the lane-use table. To validate a lane-use table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The node, link, and lane references are correct.

- The vehicle types to which restrictions apply are consistent with the vehicle types allowed in the link.

Table 7. Lane-use table format.

Column Name	Description	Allowed Values
NODE	ID number of the node toward which the lane leads.	integer: 1 through 2,147,483,647
LINK	ID number of the link on which the lane lies.	integer: 1 through 2,147,483,647
LANE	Lane number.	integer: 1 through 255
VEHICLE	Vehicle type(s) to which restriction applies.	string of characters separated by slashes: HOV2 = high-occupancy vehicle with two or more occupants HOV3 = high-occupancy vehicle with three or more occupants HOV4 = high-occupancy vehicle with four or more occupants BICYCLE = bicycle AUTO = private auto TRUCK = motor carrier BUS = bus TROLLEY = trolley STREETCAR = streetcar LIGHTRAIL = light rail transit RAPIDRAIL = rail rapid transit REGIONRAIL = regional rail
RESTRICT	Type of lane restriction.	one character: O = only this vehicle type may use lane R = lane required to be used by this vehicle type N = lane not allowed to be used by this vehicle type

Column Name	Description	Allowed Values
STARTTIME	Starting time for the restriction. This field is ignored in the current TRANSIMS release—current tables should not include records depending on the STARTTIME/ENDTIME fields.	a character string with the day of week: SUN = Sunday MON = Monday TUE = Tuesday WED = Wednesday THU = Thursday FRI = Friday SAT = Saturday WKE = any weekend day WKD = any weekday ALL = any day The day is followed by the time of day (on a 24-hour clock). For example, WKD13:20 is any weekday at 1:20 in the afternoon
ENDTIME	Ending time for the restriction. This field is ignored in the current TRANSIMS release—current tables should not include records depending on the STARTTIME/ENDTIME fields.	specified like STARTTIME
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.6 Parking Table

Table 8 specifies the format for the parking table. To validate a parking table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The IDs are unique.
- The node and link references are correct.
- The offset is consistent with the setbacks and length of the link.
- The vehicle types allowed for the parking are consistent with the vehicle types allowed on the link.

Table 8. Parking table format.

Column Name	Description	Allowed Values
ID	ID number of the parking place.	integer: 1 through 2,147,483,647
NODE	ID number of the node toward which vehicles are traveling.	integer: 1 through 2,147,483,647

Column Name	Description	Allowed Values
LINK	ID number of the link on which the parking place lies.	integer: 1 through 2,147,483,647
OFFSET	Location of the entrance from the link to the parking place, measured (in meters) from NODE.	non-negative floating-point number
STYLE	Type of the parking place.	five characters: PRSTR = parallel on street HISTR = head in on street DRVWY = driveway LOT = parking lot BNDRY = network boundary
CAPACITY	Number of vehicles the parking place can accommodate; zero for unlimited capacity.	integer: 0 through 65,535
GENERIC	Whether the parking place represents generic parking (not an actual driveway, lot, etc., but a group/aggregate of them used to simplify modeling).	one character: T = true/yes F = false/no
VEHICLE	Type of vehicle(s) allowed to park at the parking place.	string of characters separated by slashes: AUTO = private auto TRUCK = motor carrier BICYCLE = bicycle TAXI = paratransit BUS = bus TROLLEY = trolley STREETCAR = streetcar LIGHTRAIL = light-rail transit RAPIDRAIL = rail-rapid transit REGIONRAIL = regional rail ANY = any vehicle type

Column Name	Description	Allowed Values
STARTTIME	Starting time for parking. This field is ignored in the current TRANSIMS release—current tables should not include records depending on the STARTTIME/ENDTIME fields.	a character string with the day of week: SUN = Sunday MON = Monday TUE = Tuesday WED = Wednesday THU = Thursday FRI = Friday SAT = Saturday WKE = any weekend day WKD = any weekday ALL = any day The day is followed by the time of day (on a 24-hour clock). For example WKD13:20 is any weekday at 1:20 in the afternoon
ENDTIME	Ending time for parking. This field is ignored in the current TRANSIMS release—current tables should not include records depending on the STARTTIME/ENDTIME fields.	specified like STARTTIME
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.7 Transit Stop Table

Table 9 specifies the format for the transit stop table. To validate a transit stop table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The IDs are unique.
- The node and link references are correct.
- The offset is consistent with the setbacks and length of the link.
- The vehicle types allowed for the transit stop are consistent with the vehicle types allowed on the link.

Table 9. Transit stop table format.

Column Name	Description	Allowed Values
ID	ID number of the stop.	integer: 1 through 2,147,483,647
NAME	Name of the stop.	50 characters

Column Name	Description	Allowed Values
NODE	ID number of the node toward which vehicles are traveling.	integer: 1 through 2,147,483,647
LINK	ID number of the link on which the stop takes place.	integer: 1 through 2,147,483,647
OFFSET	Location of the stop, which is measured (in meters) from NODE.	non-negative floating-point number
VEHICLE	Types of vehicles for which this is a stop.	string of characters separated by slashes: BUS = bus TROLLEY = trolley STREETCAR = streetcar LIGHTRAIL = light-rail transit RAPIDRAIL = rail-rapid transit REGIONRAIL = regional rail
STYLE	Type of stop.	ten characters: STOP = stop (no station) STATION = station
CAPACITY	Number of vehicles the stop can simultaneously handle; zero for unlimited capacity.	integer: 0 through 65,535
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.8 Lane Connectivity Table

Table 10 specifies the format for the lane connectivity table. To validate a lane connectivity table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The node, link, and lane references are correct.
- Each lane has at least one incoming and at least one outgoing connection.

Table 10. Lane connectivity table format.

Column Name	Description	Allowed Values
NODE	ID number of the node.	integer: 1 through 2,147,483,647
INLINK	ID number of the incoming link.	integer: 1 through 2,147,483,647
INLANE	Lane number of the incoming lane.	integer: 1 through 255
OUTLINK	ID number of the outgoing link.	integer: 1 through 2,147,483,647
OUTLANE	Lane number of the outgoing lane.	integer: 1 through 255

Column Name	Description	Allowed Values
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.9 Unsignalized Node Table

Table 11 specifies the format for the unsignalized node table. To validate an unsignalized node table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The node and link references are correct.
- Each incoming link entering an unsignalized node has a record.

Table 11. Unsignalized node table format.

Column Name	Description	Allowed Values
NODE	ID number of the node.	integer: 1 through 2,147,483,647
INLINK	ID number of the incoming link.	integer: 1 through 2,147,483,647
SIGN	Type of sign control on the link.	one character: S = stop Y = yield N = none
NOTES	Character string used for data-quality annotations; free format (may be blank).	255 characters

1.1.10 Signalized Node Table

Table 12 specifies the format for the signalized node table. To validate a signalized node table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The node references are correct.
- The plan references are correct.
- Each node has either one signalized or one unsignalized control.
- All plans are used.
- The start times are valid.

Table 12. Signalized node table format.

Column Name	Description	Allowed Values
NODE	ID number of the node.	integer: 1 through 2,147,483,647
TYPE	Type of the signal.	one character: T = timed A = actuated
PLAN	ID number of a timing plan.	integer: 1 through 65,535
OFFSET	Relative offset (in seconds) for coordinated signals.	non-negative floating-point number
STARTTIME	Starting time for the plan. This field is ignored in the current TRANSIMS release—current tables should not include records depending on the STARTTIME/ENDTIME fields.	a character string with the day of week: SUN = Sunday MON = Monday TUE = Tuesday WED = Wednesday THU = Thursday FRI = Friday SAT = Saturday WKE = any weekend day WKD = any weekday ALL = any day The day is followed by the time of day (on a 24-hour clock). For example WKD13:20 is any weekday at 1:20 in the afternoon
COORDINATR	ID number of coordinator for the signal; equivalent to NODE number if signal is isolated.	integer: 1 through 2,147,483,647
RING	Single or dual ring, required only for TYPE = 'A'.	one character: S = single D = dual
ALGORITHM	Control algorithm used by signal, required only for TYPE = 'A'.	ten characters
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.11 Phasing Plan Table

Table 13 specifies the format for the phasing plan table. To validate a phasing plan table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The plan, phase, node, and link references are correct.
- Each incoming and outgoing link is controlled.

Table 13. Phasing plan table format.

Column Name	Description	Allowed Values
NODE	ID number of the node.	integer: 1 through 2,147,483,647
PLAN	ID number of the timing plan.	integer: 1 through 65,535
PHASE	Phase number.	integer: 1 through 255
INLINK	ID number of the incoming link.	integer: 1 through 2,147,483,647
OUTLINK	ID number of the outgoing link.	integer: 1 through 2,147,483,647
PROTECTION	Movement protection indicator.	one character: P = protected U = unprotected S = unprotected after stop
DETECTORS	ID number of detectors related to this movement. This is required only for actuated controls.	string of detector IDs, separated by slashes
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.12 Timing Plan Table

Table 14 specifies the format for the timing plan table. To validate a timing plan table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The (plan, phase) pairs are unique.
- The time values are consistent.
- The phase sequence references existent phases.

Table 14. Timing plan table format.

Column Name	Description	Allowed Values
PLAN	ID number of timing plan.	integer: 1 through 65,535
PHASE	Phase number.	integer: 1 through 255
NEXTPHASES	Phase number(s) of the next phase(s) in sequence.	string of phase numbers, separated by slashes
GREENMIN	Minimum length (in seconds) of the green interval, or fixed green length for timed signal.	non-negative floating-point number
GREENMAX	Maximum length (in seconds) of the green interval.	non-negative floating-point number
GREENEXT	Length (in seconds) of the green extension interval.	non-negative floating-point number
YELLOW	Length (in seconds) of the yellow interval.	non-negative floating-point number

Column Name	Description	Allowed Values
REDCLEAR	Length (in seconds) of the red clearance interval.	non-negative floating-point number
GROUPFIRST	For pre-timed or single ring: 1 if first phase, 0 if not first phase; for dual ring: number of phase group for which this phase is first phase, 0 if not first phase in the phase group.	integer: 0 through 255
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.13 Detector Table

Table 15 specifies the format for the detector table. To validate a detector table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The IDs are unique.
- The node, link, and lane references are correct.
- The offset and length are consistent with the setbacks and length of the link.

Table 15. Detector table format.

Column Name	Description	Allowed Values
ID	ID number of the detector.	integer: 1 through 2,147,483,647
NODE	ID number of the node toward which vehicles are traveling.	integer: 1 through 2,147,483,647
LINK	ID number of the link on which the detector lies.	integer: 1 through 2,147,483,647
OFFSET	Starting position of the detector, which is measured (in meters) from NODE.	non-negative floating-point number
LANEBEGIN	Lane number of lane at which the detector begins.	integer: 1 through 255
LANEEND	Lane number at which the detector ends, equal to LANEBEGIN for detector that lies on single lane.	integer: 1 through 255
LENGTH	Length of the detector (in meters).	non-negative floating-point number
STYLE	Type of the detector.	ten characters: PRESENCE = sense vehicles on detector PASSAGE = sense vehicles crossing detector
COORDINATR	ID number of coordinators interested in detector output.	string of coordinator IDs separated by slashes

Column Name	Description	Allowed Values
CATEGORY	Identifies parameters for the defects this type of detector exhibits.	ten characters: must match last characters of NET_DETECTOR_* configuration file keys. A value of 0 may be used to specify no defects.
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.14 Activity Locations

Table 16 specifies the format for the activity location table. To validate an activity location table, verify the following.

- The field names and types are correct.
- The data values are in the legal ranges.
- The IDs are unique.
- The node and link references are correct.
- The offset is consistent with the setbacks and lengths of the links.
- The layer is consistent with the vehicle types allowed on the link.
- The names of any optional user-defined fields are unique within the table.

Table 16. Activity locations.

Column Name	Description	Allowed Values
ID	ID number of the activity location.	integer: 1 through 2,147,483,647
NODE	ID number of the node toward which vehicles are traveling (the location is taken to be on the right side of the street when headed this direction).	integer: 1 through 2,147,483,647
LINK	ID number of the link on which the activity location lies.	integer: 1 through 2,147,483,647
OFFSET	Location of the entrance from the link to the activity location, which is measured (in meters) from NODE.	non-negative floating-point number
LAYER	The modal "layer" on which the activity location resides.	string of characters: AUTO BUS LIGHTRAIL WALK
EASTING	The x-coordinate of the node (in meters, UTM coordinate system).	floating-point number
NORTHING	The y-coordinate of the node (in meters, UTM coordinate system).	floating-point number

Column Name	Description	Allowed Values
ELEVATION	The z-coordinate of the node (in meters, UTM coordinate system).	floating-point number
optional field 1	First optional field related to land use.	floating-point number
optional field 2	Second optional field related to land use.	floating-point number
optional field n	The n-th optional field related to land use.	floating point number
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

A maximum of 20 user-defined fields optionally may be included in the table between the ELEVATION and NOTES fields. These optional fields are typically related to land use, but could be anything the user wishes to specify about an activity location. The column names may be up to 32 characters in length. The presence of any optional fields is detected by the `NetReadActivityLocationHeader()` function. This implies that the header for the activity location table must be read by this function rather than by `NetReadHeader()` or `NetSkipHeader()`, whether or not optional fields are included.

1.1.15 Process Links

Table 17 specifies the format for a process link table. To validate a process link table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The IDs are unique.
- The “from” and “to” accessory references are correct.

Table 17. Process links.

Column Name	Description	Allowed Values
ID	ID number of the virtual link.	integer: 1 through 2,147,483,647
FROMID	ID number of the accessory from which the virtual link leaves.	integer: 1 through 2,147,483,647
FROMTYPE	Type of accessory from which the virtual link leaves.	string of characters: ACTIVITY PARKING TRANSIT
TOID	ID number of the accessory to which the virtual link leads.	integer: 1 through 2,147,483,647
TOTYPE	Type of accessory to which the virtual link leads.	string of characters: ACTIVITY PARKING TRANSIT

DELAY	The time delay (measured in seconds) incurred when traveling across the virtual link.	non-negative floating-point number
COST	The cost (measured in arbitrary units) incurred when traveling across the virtual link. Note that although the costs are measured for arbitrary units, the units must be the same for the whole data table.	non-negative floating-point number
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.1.16 Study Area Link Table

➠*This feature may be deleted in future releases.*

Table 18 specifies the format for the study area link table. This table is optional. If it is not referenced in the configuration file, then all links will be in the study area. If the table is provided, it must contain every link in the network. To validate a study area link table, verify the following:

- The field names and types are correct.
- The data values are in the legal ranges.
- The link references are correct.

Table 18. Study area link table format.

Column Name	Description	Allowed Values
ID	ID number of the link.	integer: 1 through 2,147,483,647
BUFFER	Whether the link is in the buffer area or the study area.	one character: Y = in buffer area N = in study area
NOTES	Character string used for data quality annotations; free format (may be blank).	255 characters

1.2 Utility Programs

Several utility programs related to network data files are available.

1.2.1 ReadNetwork

The *ReadNetwork* utility reads a specified set of network tables into memory and constructs C++ network objects out of it. It verifies that a network can be read by the route planner and the traffic microsimulator without actually running those programs. It takes a configuration file as its only argument.

1.2.2 SetupNetwork

The *SetupNetwork* script copies a set of empty and test network tables into a specified directory. It is useful for building a new network database directory. It takes the name of the directory as its only argument.

1.2.3 CleanupNetwork

The *CleanupNetwork* script removes a set of tables created by *SetupNetwork*. It takes the name of the directory as its argument.

1.3 Files

Table 19 lists the network library files.

Table 19. Network library files.

Type	File Name	Description
Binary Files	*libTIO.a*	TRANSIMS Interfaces library
Utilities	*ReadNetwork*	Network data file reader
	ValidateNetwork	Network data file validator
	SetupNetwork	Tool for creating empty and test network data files
	CleanupNetwork	Tool for removing empty and test network data files
Source Files	*netio.c*	Defines network data structures and interface functions
	netio.h	Network interface functions source file

1.4 Configuration File Keys

Table 20 and Table 21 list the TRANSIMS configuration file keys that specify the location of network data files and the definitions of network-related parameters. The detector defect keys (Table 21) provide parametric definitions for categories of detectors. The category of each detector is specified in the `CATEGORY` field in the Detector Table (see Table 15). In the detector defect keys, the trailing "c" must be replaced by a string that matches a value in the `CATEGORY` field. All values used for `CATEGORY` (except the special value 0) should be defined with detector defect keys. The default for defect keys that are not defined is to treat the detector as though it is non-defective for the undefined characteristic.

Table 20. Network file configuration file keys.

Configuration File Key	Description
`NET_ACTIVITY_LOCATION_TABLE`	Activity location table name.
`NET_ACTUATED_ALGORITHM_B_BETA`	Velocity factor for actuated algorithm B. Default = 1.0 meters/sec
`NET_ACTUATED_ALGORITHM_B_DENSITY_CONST`	Density factor for actuated algorithm B. Default = 0.0/meter
`NET_ACTUATED_ALGORITHM_B_FLOW_CONST`	Flow factor for actuated algorithm B. Default = 0.1/sec

Configuration File Key	Description
NET_BARRIER_TABLE	Barrier table name.
NET_DETECTOR_PRESENCE_SAMPLE_TIME	Presence detector sampling frequency. Default = 1 sec
NET_DETECTOR_RETENTION_TIME	Retention time for detections. Detections are retained until all interested signals have examined them once or for NET_DETECTOR_RETENTION_TIME, whichever is longer. Default = 0 sec (i.e., cleared after used once)
NET_DETECTOR_TABLE	Detector table name.
NET_DIRECTORY	Directory where the network files reside.
NET_LANE_CONNECTIVITY_TABLE	Lane connectivity table name.
NET_LANE_USE_TABLE	Lane use table name.
NET_LANE_WIDTH	Default lane width (meters).
NET_LINK_MEDIAN_HALFWIDTH	Default half-width (meters) of the median between lanes on a link. • To correspond with the current release of the Output Visualizer, this parameter must be assigned a value of 0.5 * NET_LANE_WIDTH.
NET_LINK_TABLE	Link table name.
NET_NODE_TABLE	Node table name.
NET_PARKING_TABLE	Parking table name.
NET_PHASING_PLAN_TABLE	Phasing plan table name.
NET_POCKET_LANE_TABLE	Pocket lane table name.
NET_PROCESS_LINK_TABLE	Process link table name.
NET_SIGNAL_COORDINATOR_TABLE	Signal coordinator table name.
NET_SIGNALIZED_NODE_TABLE	Signalized node table name.
NET_SPEED_TABLE	Speed table name.
NET_STUDY_AREA_LINKS_TABLE	Study area links table name.
NET_TIMING_PLAN_TABLE	Timing plan table name.
NET_TRANSIT_STOP_TABLE	Transit stop table name.
NET_TURN_PROHIBITION_TABLE	Turn prohibition table name.
NET_UNSIGNALIZED_NODE_TABLE	Unsignalized node table name.

Table 21. Detector defect keys.

Configuration File Key	Description
NET_DETECTOR_ACCELERATION_NOISE_c	Standard deviation of random error in detection acceleration (meters/second/second).
NET_DETECTOR_ACCELERATION_OFFSET_c	Systematic error in detection acceleration (meters/second/second).
NET_DETECTOR_FAILURE_TIME_MEAN_c	Mean time (seconds) between detector catastrophic failures. A value of 0 indicates no failures.

Configuration File Key	Description
NET_DETECTOR_FALSE_ALARM_PROBABILITY_c	Probability of counting the same detection twice.
NET_DETECTOR_FALSE_ALARM_TIME_MEAN_c	Mean time (seconds) between spontaneous false alarms (i.e., recording a detection when no vehicle was there). A value of 0 indicates no spontaneous false alarms.
NET_DETECTOR_INITIAL_FAILURE_PROBABILITY_c	Probability detector is broken at beginning of simulation.
NET_DETECTOR_MISS_ACCELERATION_PROBABILITY_c	Probability of missing the acceleration component of a detection.
NET_DETECTOR_MISS_POSITION_PROBABILITY_c	Probability of missing the position component of a detection.
NET_DETECTOR_MISS_PROBABILITY_c	Probability of detector missing a detection.
NET_DETECTOR_MISS_VELOCITY_PROBABILITY_c	Probability of missing the velocity component of a detection.
NET_DETECTOR_POSITION_NOISE_c	Standard deviation of random error in detection position (meters).
NET_DETECTOR_POSITION_OFFSET_c	Systematic error in detection position (meters).
NET_DETECTOR_VELOCITY_NOISE_c	Standard deviation of random error in detection velocity (meters/second).
NET_DETECTOR_VELOCITY_OFFSET_c	Systematic error in detection velocity (meters/second).
NET-DETECTOR_REPAIR_TIME_MAX_c	Maximum time (seconds) until failed detector is repaired. A value of 0 indicates detector is immediately repaired. A value of -1 indicates no repair.

1.5 Examples

Appendix A provides a network files example.

2. TRANSIT FILES

In this section, we discuss how to describe transit routes and schedules for the TRANSIMS Route Planner and Traffic Microsimulator. Before reading the sections in this volume, you should have already read Volume One (*Technical Overview*). This volume serves as a foundation for understanding Volume Three (*Modules*).

2.1 File Format

The transit route file (configuration parameter `TRANSIT_ROUTE_FILE`) describes the transit network topology. This ASCII text file describes the transit stops along which vehicles on each transit route are allowed to stop.

The transit schedule file (configuration parameter `TRANSIT_SCHEDULE_FILE`) describes the transit schedule. This ASCII text file lists the times at which a transit vehicle visits the transit stops.

2.1.1 Transit Route File Format

An ASCII text file, the Transit Route File has fields that are separated by white space [e.g., space(s), tab(s), or newline(s)]. The column names are currently not part of the route files. Table 22 lists the transit route file data definitions and format.

Table 22. Transit route file data definitions and format.

Column Name	Description	Allowed Values
`Transit Route ID`	A unique identifier for this route.	integer
`Number of Stops`	The number of transit stops to follow.	integer

`Transit Type`	The type of transit vehicle serving this route.	`BUS`
		`TROLLEY`
		`STREETCAR`
		`LIGHTRAIL`
		`RAPIDRAIL`
		`REGIONALRAIL`

`Transit Stop ID`	ID of the transit stop.	integer
`Link ID`	ID of the link on which the transit stop resides.	integer
`Node ID`	ID of the node toward which the vehicle is heading.	integer
`Transit Zone`	ID of the zone in which the transit stop is located (or 0 if the cost is not zone based).	integer

For each route, the file contains:

- the route ID,
- the number of transit stops the route visits, and
- the type of transit vehicle serving this route.

The route ID must be unique across transit types. Each route record is followed by multiple transit stop records (as many as is specified by the number of stops found in the route record).

For each stop, the following are listed:

- the transit stop ID (in the order visited by the transit vehicle),
- the link on which the stop resides,
- the node the vehicle is heading toward, and
- the transit zone in which the stop is located.

The zone field is 0 if the zones are not used for determining rider costs.

2.1.2 Transit Schedule and Format

The Transit Schedule File is an ASCII text file whose fields are separated by white space (as described above). The file must be sorted by Transit Route ID and time—in that order. The column names are currently not part of the schedule file. Table 23 provides transit schedule file data definitions and format.

Table 23. Transit schedule file data definitions and format.

Column Name	Description	Allowed Values
`Transit Route ID`	A unique identifier for this route.	integer
`Time`	Departure time at the stop.	integer: seconds since midnight
`Transit Stop ID`	ID of this transit stop, as specified in the network data tables.	integer

2.2 Utility Programs

>>>>>None identified at this time.

2.3 Files

Table 24 lists the transit library files.

Table 24. Transit library files.

Type	File Name	Description
Binary Files	*libTIO.a*	TRANSIMS Interfaces library
Source Files	*transitio.c*	Defines transit data structures and interface functions
	transitio.h	Transit interface functions source file

2.4 Configuration File Keys

Table 25 lists the transit configuration file keys.

Table 25. Transit file configuration file keys.

Configuration File Key	Description
TRANSIT_ROUTE_FILE	The name of a transit route file whose format is described. Used as input by the Traffic Microsimulator and the Route Planner.
TRANSIT_SCHEDULE_FILE	The name of a transit schedule file whose format is described above. Used as input by the Route Planner.
TRANSIT_ZONE_FILE	The name of a transit zone file whose format is described above. Currently unused.

2.5 Examples

>>>>>None identified at this time.

3. VEHICLE FILE

This section describes the TRANSIMS vehicle file. The TRANSIMS Population Synthesizer generates and assigns private vehicles to households. The Activity Generator assigns a set of possible vehicles to each member of a household.

Freight and transit vehicles (and the plans for their drivers) are generated by separate utilities, but these must be included in the vehicle database. The vehicle IDs assigned by these utilities must be unique.

3.1 File Format

Fields in the ASCII vehicle file are tab- or space-delimited. The first line of the file must contain the field names. Each line of the vehicle file contains five mandatory fields:

- household ID,
- vehicle ID,
- ID of the starting location,
- the type of the vehicle, and
- a user-defined vehicle subtype used for emissions.

Each line may contain optional integer fields whose meaning is user defined. The number of these identifier fields may vary among different vehicle files. The number of optional identifier fields must be the same on every line within a vehicle file. The value *-1* is used as a default placeholder value for both the starting location and optional integer fields when the values are unknown or unused. Table 26 specifies the content of the required fields in the vehicle file.

Table 26. Vehicle file specification.

Column Name	Description
HHID	household ID
VEHICLE	vehicle ID
LOCATION	ID of vehicle's starting location
VEHTYPE	vehicle type, which is one of the following: 1 = AUTO 2 = TRUCK 4 = TAXI 5 = BUS 6 = TROLLEY 7 = STREETCAR 8 = LIGHTRAIL 9 = RAPIDRAIL

Column Name	Description
	10 = REGIONALRAIL
VSUBTYPE	vehicle subtype, used for emissions. The vehicle subtype must correspond to a vehicle subtype specified in the vehicle prototype file.

3.2 Utility Programs

>>>>>None identified at this time.

3.3 Files

Table 27 contains vehicle library files

Table 27. Vehicle library files.

Type	File Name	Description
Binary Files	*libTIO.a*	The TRANSIMS Interfaces library
Source Files	*vehio.h*	Defines vehicle data structures and interface functions
	vehio.c	Vehicle interface functions source file

3.4 Configuration File Keys

Table 28 contains vehicle file configuration file keys.

Table 28. Vehicle file configuration file key.

Configuration File Key	Description
VEHICLE_FILE	The path of the vehicle file.

3.5 Examples

Appendix B contains vehicle file examples.

4. VEHICLE PROTOTYPE FILE

This section describes the TRANSIMS vehicle prototype file. This file is used primarily by the Traffic Microsimulator to define characteristics common to whole categories of simulated vehicles. These characteristics include the vehicle type and subtype, its maximum velocity and acceleration, the vehicle length, and its occupant capacity. All vehicles used in the simulation must have a prototype.

4.1 File Format

Fields in the vehicle prototype file are tab- or space-delimited. The first line of the file must contain the field names.

Each line of the vehicle prototype file contains six mandatory fields:

1. the vehicle type,
2. a user-defined vehicle subtype used for emissions,
3. vehicle maximum velocity,
4. vehicle maximum acceleration,
5. vehicle length, and

- vehicle capacity.

Table 29 describes the contents of the vehicle prototype files.

Table 29. Vehicle prototype file specification.

Column Name	Description
VEHTYPE	vehicle type, which is one of the following: 1 = AUTO 2 = TRUCK 4 = TAXI 5 = BUS 6 = TROLLEY 7 = STREETCAR 8 = LIGHTRAIL 9 = RAPIDRAIL 10 = REGIONALRAIL
VSUBTYPE	vehicle subtype, used for emissions.
MAXVEL	maximum velocity (meters/second)
MAXACCEL	maximum acceleration (meters/second/second)
LENGTH	vehicle length (meters)
CAPACITY	vehicle capacity (driver + number of possible passengers)

4.2 Utility Programs

>>>>>None identified at this time.

4.3 Files

Table 30 contains vehicle prototype library files.

Table 30. Vehicle prototype library files.

Type	File Name	Description
Binary Files	*libTIO.a*	TRANSIMS Interfaces library.
Source Files	*vehprotoio.h*	Defines vehicle prototype data structures and interface functions.
	vehprotoio.c	Vehicle prototype functions source file.

4.4 Configuration File Keys

Table 31 shows the vehicle prototype configuration file key.

Table 31. Prototype file configuration file key.

Configuration File Key	Description
`VEHICLE_PROTOTYPE_FILE`	The path of the vehicle prototype file.

4.5 Examples

Appendix C contains vehicle prototype file examples.

Appendix A: Network files examples

Fig. 1 shows the layout of the network used for testing various TRANSIMS modules. Note the following about this network:

- Three of the nodes (8521, 14136, and 14141) in the node are associated with intersections, while another (8520) is associated with a change in the permanent number of lanes.
- Entries in the link table illustrate how the permanent number of lanes, left pocket lanes, and right pocket lanes are counted and numbered.
- All three types of pocket lanes (turn pocket, merge pocket, and pull-out pocket) are represented in the pocket lane table.
- Several types of parking (lot, street, driveway, and generic vs. actual) are represented in the parking table.
- The first six rows in the lane connectivity table may be understood as follows: Lanes 1 and 2 on link 11487 (attached to node 14141) are exclusive left-turn lanes connecting only to lanes 1 and 2 on link 11486. Lanes 3, 4, and 5 on link 11487 are through lanes to lanes 1, 2, 3, and on link 11495. Lane 6 on link 11487 is a right-turn-only lane connecting to lane 3 on link 28800. Lane 3 on link 11486 connects on both lane 2 on link 28800 and lane 3 on link 11487, as shown in rows 9 and 10 of the table.
- The number of permanent lane changes from three lanes changes from three lanes on link 28800 to four lanes on link 12384 at node 8520. No right-of-way sign control is required at this node. A stop sign is indicated on link 12407 at node 14136, with no sign control on the other two links at this node. The unsignalized node table illustrates this.
- Node 14141 has a pre-timed signal control with an offset of 19.0 seconds. A single timing and phasing plan is always in effect. Node 8521 is defined as having an actuated signal and two timing and phasing plans. The signalized node table illustrates this.
- The movements permitted during phase 1 at node 14141 are through movements between links 11487 and 11495, as well as right-turn movements from these links. Additionally, unprotected right turns are permitted from links 11486 and 28800 during phase 1. The first six rows of the phasing plan table specify this information.
- Plan 1 in the timing table was specified in the signalized node table as acceptable to node 14141. This is a timed signal with green, yellow, and red clearance intervals as indicated in row 1 of the table. Plans 2 and 3 for node 8521 were invented as illustrations and may not make sense as real timing plans.

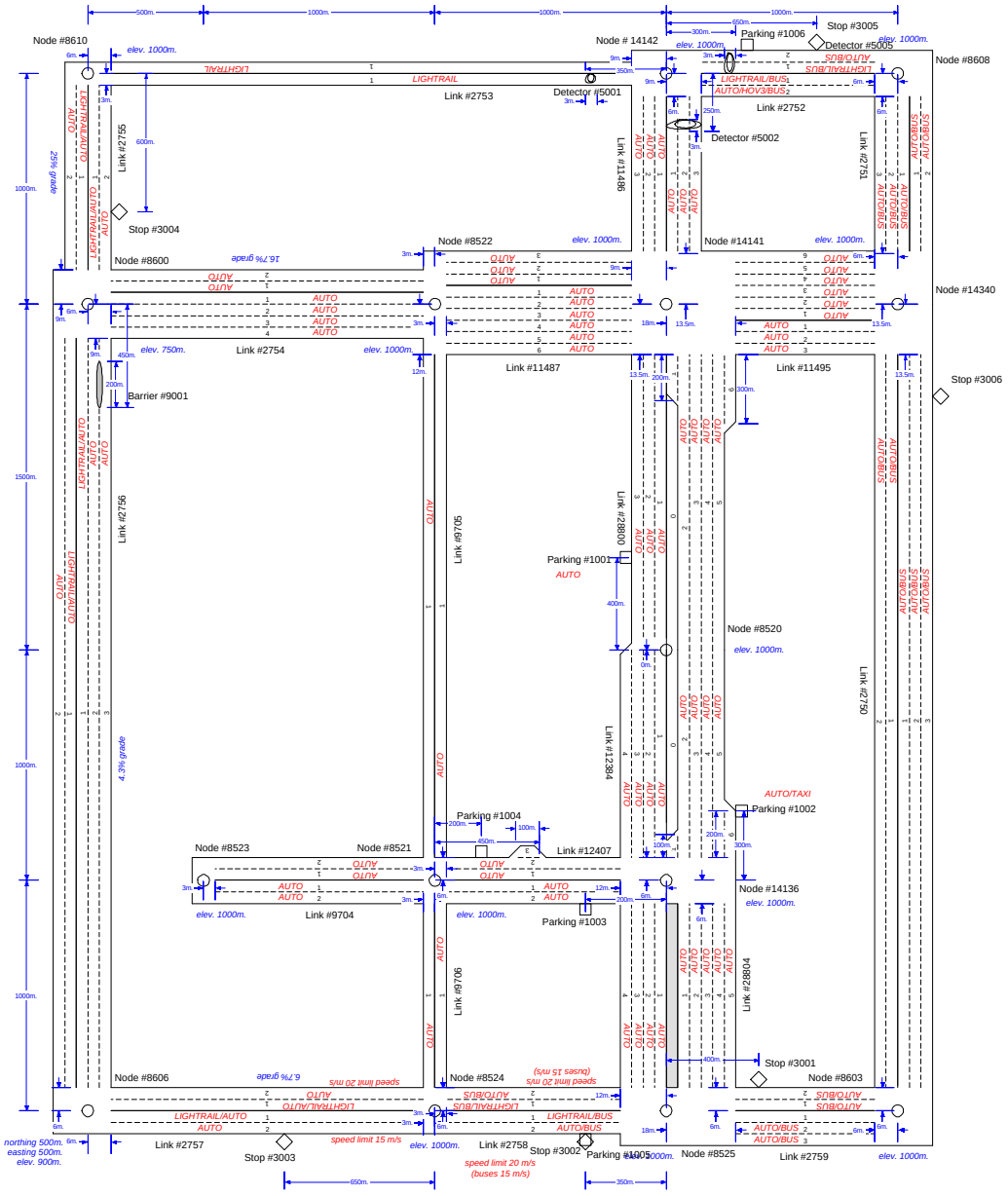

Fig. 1. Layout of test network.

The following is the configuration file for the network. This network contains most of the network objects available in TRANSIMS; it can be used for testing code or in simulations of traffic. Refer back to **Table 20** for a listing the configuration file keys for this network.

```
# Network subsystem configuration file keys for the test network.

# The directory where the network files reside.
NET_DIRECTORY /home/projects/transims/networks/test

# The node table name.
NET_NODE_TABLE Test_Node_Table

# The link table name.
NET_LINK_TABLE Test_Link_Table

# The pocket lane table name.
NET_POCKET_LANE_TABLE Test_Pocket_Lane_Table

# The parking table name
NET_PARKING_TABLE Test_Parking_Table

# The lane connectivity table name.
NET_LANE_CONNECTIVITY_TABLE Test_Lane_Connectivity_Table

# The unsignalized node table name.
NET_UNSIGNALIZED_NODE_TABLE Test_Unsignalized_Node_Table

# The signalized node table name.
NET_SIGNALIZED_NODE_TABLE Test_Signalized_Node_Table

# The phasing plan table name.
NET_PHASING_PLAN_TABLE Test_Phasing_Plan_Table

# The timing plan table name.
NET_TIMING_PLAN_TABLE Test_Timing_Plan_Table

# The speed table name.
NET_SPEED_TABLE Test_Speed_Table

# The lane use table name.
NET_LANE_USE_TABLE Test_Lane_Use_Table

# The transit stop table name.
NET_TRANSIT_STOP_TABLE Test_Transit_Stop_Table

# The signal coordinator table name.
NET_SIGNAL_COORDINATOR_TABLE Test_Signal_Coordinator_Table

# The detector table name.
NET_DETECTOR_TABLE Test_Detector_Table

# The turn prohibition table name.
NET_TURN_PROHIBITION_TABLE Test_Turn_Prohibition_Table

# The barrier table name.
NET_BARRIER_TABLE Test_Barrier_Table

# The activity location table name.
NET_ACTIVITY_LOCATION_TABLE Test_Activity_Location_Table

# The process link table name.
NET_PROCESS_LINK_TABLE Test_Process_Link_Table

# The study area links table name.
NET_STUDY_AREA_LINKS_TABLE Test_Study_Area_Link_Table

# The half-width (meters) of the median on a link.
# Default value if this keyword is omitted is
# 0.5 * GBL_LANE_WIDTH NET_LINK_MEDIAN_HALFWIDTH    1.75
```

Table 32 through Table 49 list the contents of the tables.

Table 32. Test node table.

ID	EASTING	NORTHING	ELEVATION	NOTES
8520	3000	2500	1000	
8521	2000	1500	1000	
14136	3000	1500	1000	
14141	3000	4000	1000	
14142	3000	5000	1000	
14340	4000	4000	1000	
8525	3000	500	1000	
8522	2000	4000	1000	
8523	1000	1500	1000	
8524	2000	500	1000	
8606	500	500	900	
8603	4000	500	1000	
8608	4000	5000	1000	
8600	500	4000	750	
8610	500	5000	1000	

Table 33. Text link table.

ID	NAME	NODEA	NODEB	PERMLANESA	PERMLANESB	LEFTPCKTSA	LEFTPCKTSB	RGHTPCKTSA	RGHTPCKTSB	TWOWAYTURN	LENGTH	GRADE	SETBACKA	SETBACKB	CAPACITYA	CAPACITYB	SPEEDLMTA	SPEEDLMTB	FREESPDA	FREESPDB	FUNCTCLASS	THRUA	THRUB	COLOR	VEHICLE	NOTES
9704	2nd Street	8521	8523	2	2	0	0	0	0	F	1000	0	3	3	800	1000	20	20	25	25	OTHER	12407	9704	4	AUTO	
9705	Avenue B	8521	8522	1	1	0	0	0	0	F	2500	0	6	12	800	1000	20	20	25	25	ZONECONN	9706	11487	1	AUTO	
9706	Avenue B	8521	8524	1	1	0	0	0	0	F	1000	0	6	6	800	1000	20	20	25	25	RAMP	9705	2758	3	AUTO	
11486	Avenue C	14141	14142	3	3	0	0	0	0	F	1000	0	13.5	6	800	1000	20	20	25	25	FRONTAGE	28800	2752	4	AUTO	
11487	3rd Street	8522	14141	3	6	0	0	0	0	F	1000	0	3	9	800	1000	20	20	25	25	SECARTER	2754	11495	2	AUTO	
11495	3rd Street	14141	14340	6	3	0	0	0	0	F	1000	0	18	6	800	1000	20	20	25	25	COLLECTOR	11487	2750	3	AUTO	
12384	Avenue C	14136	8520	4	4	0	1	0	1	T	1000	0	6	0	800	1000	20	20	25	25	FREEWAY	28804	28800	4	AUTO	
12407	2nd Street	8521	14136	2	2	0	0	1	0	F	1000	0	3	12	500	500	20	20	25	25	XPRESSWAY	9704	12384	2	AUTO	
28800	Avenue C	8520	14141	3	4	0	1	0	1	T	1500	0	0	13.5	800	1000	20	20	25	25	PRIARTER	12384	11486	1	AUTO	
28804	Avenue C	14136	8525	5	4	0	0	0	0	F	1000	0	6	6	800	1000	20	20	25	25	LOCAL	12384	2759	1	AUTO	
2759	1st Street	8525	8603	2	3	0	0	0	0	F	1000	0	18	6	800	1000	20	20	25	25	LOCAL	2758	2750	2	AUTO/BUS	
2750	Avenue D	8603	14340	2	3	0	0	0	0	F	3500	0	6	13.5	800	1000	20	20	25	25	LOCAL	2759	2751	4	AUTO/BUS	
2751	Avenue D	14340	8608	3	2	0	0	0	0	F	1000	0	13.5	6	800	1000	20	20	25	25	LOCAL	2750	2752	1	AUTO/BUS	
2752	4th Street	8608	14142	2	2	0	0	0	0	F	1000	0	6	9	800	1000	20	20	25	25	LOCAL	2751	2753	2	AUTO/BUS/ LIGHTRAIL	
2753	4th Street	14142	8610	1	1	0	0	0	0	F	2500	0	9	6	800	1000	20	20	25	25	LIGHTRAIL	2752	2755	3	LIGHTRAIL	
2755	Avenue A	8610	8600	2	2	0	0	0	0	F	1000	.25	3	9	800	1000	20	20	25	25	LOCAL	2753	2756	1	AUTO/LIGHTRAIL	
2754	3rd Street	8600	8522	2	4	0	0	0	0	F	1500	16.7	6	3	800	1000	20	20	25	25	LOCAL	2755	11487	4	AUTO	
2756	Avenue A	8600	8606	3	2	0	0	0	0	F	3500	4.3	9	6	800	1000	20	20	25	25	LOCAL	2755	2757	3	AUTO/LIGHTRAIL	
2757	1st Street	8606	8524	2	2	0	0	0	0	F	1500	6.7	6	3	800	1000	20	20	25	25	LOCAL	2756	2758	2	AUTO/LIGHTRAIL	
2758	1st Street	8524	8525	2	2	0	0	0	0	F	1000	0	3	12	800	1000	20	20	25	25	LOCAL	2757	2759	4	AUTO/BUS/ LIGHTRAIL	

Table 34. Test speed table.

LINK	NODE	SPEEDLMT	FREESPD	VEHICLE	STARTTIME	ENDTIME	NOTES
2758	8524	15	20	BUS	ALL00:00	ALL24:00	
2758	8525	15	18	BUS	ALL00:00	ALL24:00	

Table 35. Test pocket lane table.

ID	NODE	LINK	OFFSET	LANE	STYLE	LENGTH	NOTES
85201	8520	12384	0	1	M	100	
85206	8520	12384	0	6	M	200	
85213	8521	12407	450	3	P	100	
141411	14141	28800	0	1	T	200	
141416	14141	28800	0	6	T	300	

Table 36. Test lane use table.

NODE	LINK	LANE	VEHICLE	RESTRICT	STARTTIME	ENDTIME	NOTES
8606	2757	2	AUTO/HOV3	O	ALL00:00	ALL24:00	
8524	2757	1	LIGHTRAIL	R	ALL00:00	ALL24:00	
8524	2758	1	LIGHTRAIL	R	ALL00:00	ALL24:00	
8524	2758	2	AUTO	R	ALL00:00	ALL24:00	
8525	2758	1	AUTO	N	ALL00:00	ALL24:00	
8525	2758	2	LIGHTRAIL	N	ALL00:00	ALL24:00	
8606	2756	1	LIGHTRAIL	R	ALL00:00	ALL24:00	
8600	2756	1	LIGHTRAIL	R	ALL00:00	ALL24:00	
8600	2755	2	LIGHTRAIL	N	ALL00:00	ALL24:00	
8610	2755	1	LIGHTRAIL	R	ALL00:00	ALL24:00	
14142	2752	1	LIGHTRAIL	R	ALL00:00	ALL24:00	
14142	2752	2	AUTO	R	ALL00:00	ALL24:00	
8608	2752	1	AUTO	N	ALL00:00	ALL24:00	
8608	2752	1	LIGHTRAIL	R	ALL00:00	ALL24:00	

Table 37. Test parking table.

ID	NODE	LINK	OFFSET	STYLE	CAPACITY	GENERIC	VEHICLE	STARTTIME	ENDTIME	NOTES
1001	8520	28800	400	LOT	50	T		ALL00:00	ALL24:00	
1002	14136	12384	300	PRSTR	10	T		ALL00:00	ALL24:00	
1003	14136	12407	200	HISTR	10	T		ALL00:00	ALL24:00	
1004	8521	12407	200	DRVWY	1	F	ANY	ALL00:00	ALL24:00	
1005	8525	2758	370	LOT	1	F	BUS	ALL00:00	ALL24:00	
1006	14142	2752	650	LOT	0	F	ANY	ALL00:00	ALL24:00	

Table 38. Test barrier table.

ID	NODE	LINK	OFFSET	LANE	STYLE	LENGTH	NOTES
9001	8600	2756	450	1	BARRIER	200	

Table 39. Test transit stop table.

ID	NAME	NODE	LINK	OFFSET	VEHICLE	STYLE	CAPACITY	NOTES
3001	1st & C NE	8525	2759	400	BUS	STOP	25	
3002	1st & C SW	8525	2758	350	BUS/LIGHTRAIL	STATION	0	
3003	1st & B	8524	2757	650	LIGHTRAIL	YARD	0	
3004	4th & A	8610	2755	600	LIGHTRAIL	STOP	200	
3005	4th & C	14142	2752	650	BUS/LIGHTRAIL	STATION	0	
3006	3rd & D	14340	2750	400	BUS	STOP	1	

Table 40. Test lane connectivity table.

NODE	INLINK	INLANE	OUTLINK	OUTLANE	NOTES
14141	11487	1	11486	1	
14141	11487	2	11486	2	
14141	11487	3	11495	1	
14141	11487	4	11495	2	
14141	11487	5	11495	3	
14141	11487	6	28800	3	
14141	11486	1	11495	1	
14141	11486	2	28800	1	
14141	11486	3	28800	2	
14141	11486	3	11487	3	
14141	11495	1	28800	1	
14141	11495	2	28800	2	
14141	11495	3	11487	1	
14141	11495	4	11487	2	
14141	11495	5	11487	3	
14141	11495	6	11486	3	
14141	28800	1	11487	1	
14141	28800	2	11487	2	
14141	28800	3	11486	1	
14141	28800	4	11486	2	
14141	28800	5	11486	3	
14141	28800	6	11495	3	
8520	12384	2	28800	2	
8520	12384	3	28800	3	
8520	12384	4	28800	4	
8520	12384	5	28800	5	
8520	28800	1	12384	1	
8520	28800	2	12384	2	
8520	28800	3	12384	3	
8520	28800	3	12384	4	
14136	12407	1	12384	1	
14136	12407	2	28804	4	
14136	12384	1	28804	1	
14136	12384	2	28804	2	
14136	12384	3	28804	3	
14136	12384	4	28804	4	
14136	12384	4	12407	2	
14136	28804	1	12407	1	
14136	28804	1	12384	2	
14136	28804	2	12384	3	
14136	28804	3	12384	4	
14136	28804	4	12384	5	
14136	28804	5	12384	6	
8521	12407	1	9704	1	
8521	12407	1	9706	1	
8521	12407	2	9704	2	
8521	12407	2	9705	1	
8521	9704	1	12407	1	
8521	9704	1	9705	1	
8521	9704	2	12407	2	
8521	9704	2	9706	1	
8521	9705	1	9706	1	
8521	9705	1	9704	2	
8521	9705	1	12407	1	

NODE	INLINK	INLANE	OUTLINK	OUTLANE	NOTES
8521	9706	1	9705	1	
8521	9706	1	12407	2	
8521	9706	1	9704	1	
14340	2750	1	11495	1	
14340	2750	2	11495	2	
14340	2750	2	11495	3	
14340	2750	3	2751	1	
14340	2750	3	2751	2	
14340	11495	1	2751	1	
14340	11495	2	2751	2	
14340	11495	2	2750	1	
14340	11495	3	2750	2	
14340	2751	1	2750	1	
14340	2751	1	11495	4	
14340	2751	2	2750	2	
14340	2751	2	11495	5	
14340	2751	3	11495	6	
8608	2751	1	2752	1	
8608	2751	2	2752	2	
8608	2752	1	2751	1	
8608	2752	1	2751	2	
8608	2752	2	2751	3	
8603	2759	1	2750	1	
8603	2759	2	2750	2	
8603	2759	3	2750	3	
8603	2750	1	2759	1	
8603	2750	2	2759	2	
8606	2757	1	2756	1	
8606	2757	1	2756	2	
8606	2757	2	2756	3	
8606	2756	1	2757	1	
8606	2756	2	2757	2	
8610	2753	1	2755	1	
8610	2755	1	2753	1	
8600	2756	1	2755	1	
8600	2756	2	2755	2	
8600	2756	2	2754	3	
8600	2756	3	2754	4	
8600	2754	1	2756	1	
8600	2754	2	2755	2	
8600	2755	1	2756	1	
8600	2755	2	2756	2	
8600	2755	1	2754	1	
14142	2753	1	2752	1	
14142	11486	3	2752	2	
14142	2752	1	2753	1	
14142	2752	2	11486	1	
8522	2754	1	11487	2	
8522	2754	2	11487	3	
8522	2754	3	11487	4	
8522	2754	4	11487	5	
8522	2754	4	9705	1	
8522	9705	1	11487	6	
8522	11487	1	9705	1	
8522	11487	2	2754	1	
8522	11487	3	2754	2	
8524	2758	1	2757	1	

NODE	INLINK	INLANE	OUTLINK	OUTLANE	NOTES
8524	2758	2	2757	2	
8524	2758	2	9706	1	
8524	9706	1	2757	2	
8524	9706	1	2758	2	
8524	2757	1	2758	1	
8524	2757	2	2758	2	
8524	2757	1	9706	1	
8525	2758	1	2759	2	
8525	2758	2	2759	3	
8525	2759	1	2758	1	
8525	2759	2	2758	2	
8525	2759	2	28804	5	
8525	2758	2	28804	1	
8525	28804	1	2759	1	
8525	28804	2	2759	2	
8525	28804	3	2759	3	
8525	28804	4	2758	2	

Table 41. Test unsignalized node table.

NODE	INLINK	SIGN	NOTES
8520	12384	Y	
8520	28800	N	
14136	12407	S	
14136	12384	N	
14136	28804	N	
8610	2753	N	
8610	2755	N	
14142	2753	N	
14142	11486	S	
14142	2752	N	
8608	2751	N	
8608	2752	N	
8600	2756	N	
8600	2754	S	
8600	2755	N	
8522	2754	N	
8522	9705	S	
8522	11487	N	
14340	2751	S	
14340	11495	S	
14340	2750	S	
8606	2756	N	
8606	2757	N	
8524	2757	N	
8524	2758	N	
8524	9706	Y	
8525	2758	N	
8525	2759	N	
8525	28804	S	
8603	2759	N	

NODE	INLINK	SIGN	NOTES
8603	2750	N	

Table 42. Test signalized node table.

NODE	TYPE	PLAN	OFFSET	STARTTIME	COORDINATR	RING	ALGORITHM	NOTES
14141	T	1	19	ALL00:00	0	S	B	
8521	A	2	0	ALL18:00	0	S	B	
8521	A	3	0	WKD07:00	0	S	B	

Table 43. Test phasing plan table.

NODE	PLAN	PHASE	INLINK	OUTLINK	PROTECTION	DETECTORS	NOTES
14141	1	1	11487	11495	U	0	
14141	1	1	11487	28800	P	0	
14141	1	1	11495	11487	U	0	
14141	1	1	11495	11486	P	0	
14141	1	1	11486	11487	S	0	
14141	1	1	28800	11495	S	0	
14141	1	2	11487	28800	P	0	
14141	1	2	11495	11486	P	0	
14141	1	2	11486	11495	P	0	
14141	1	2	28800	11487	P	0	
14141	1	2	28800	11495	S	0	
14141	1	2	11486	11487	S	0	
14141	1	3	11487	28800	P	0	
14141	1	3	28800	11487	P	0	
14141	1	3	28800	11486	U	0	
14141	1	3	28800	11495	P	0	
14141	1	3	11495	11486	S	0	
14141	1	3	11486	11487	S	0	
14141	1	4	11487	28800	P	0	
14141	1	4	11486	11495	U	0	
14141	1	4	11486	28800	U	0	
14141	1	4	11486	11487	P	0	
14141	1	4	28800	11486	U	0	
14141	1	4	28800	11495	P	0	
14141	1	4	11495	11486	S	0	
14141	1	5	11487	11486	P	0	
14141	1	5	11487	28800	P	0	
14141	1	5	11495	28800	P	0	
14141	1	5	11495	11486	S	0	
14141	1	5	11486	11487	P	0	
14141	1	5	28800	11495	P	0	
14141	1	6	11487	28800	P	0	
14141	1	6	11495	28800	P	0	

NODE	PLAN	PHASE	INLINK	OUTLINK	PROTECTION	DETECTORS	NOTES
14141	1	6	11495	11487	U	0	
14141	1	6	11495	11486	P	0	
14141	1	6	11486	11487	S	0	
14141	1	6	28800	11495	P	0	
8521	2	1	9705	9704	U	6006	
8521	2	1	9705	9706	U	6006	
8521	2	1	9705	12407	U	6006	
8521	2	1	9706	9705	U	6003	
8521	2	1	9706	12407	U	6003	
8521	2	1	9706	12407	U	6003	
8521	2	1	9706	9704	U	6003	
8521	2	2	12407	9704	U	6004/6005	
8521	2	2	12407	9705	U	6005	
8521	2	2	12407	9706	U	6004	
8521	2	2	9704	12407	U	6001/6002	
8521	2	2	9704	9705	U	6001	
8521	2	2	9704	9706	U	6002	
8521	3	1	9705	9704	U	6006	
8521	3	1	9705	9706	U	6006	
8521	3	1	9705	12407	U	6006	
8521	3	1	9706	9705	U	6003	
8521	3	1	9706	12407	U	6003	
8521	3	1	9706	9704	U	6003	
8521	3	2	12407	9706	P	6004	
8521	3	2	29704	9705	P	6001	
8521	3	3	12407	9704	U	6004/6005	
8521	3	3	12407	9705	U	6005	
8521	3	3	12407	9706	U	6004	
8521	3	3	9704	12407	U	6001/6002	
8521	3	3	9704	9705	U	6001	
8521	3	3	9704	9706	U	6002	

Table 44. Test timing plan table.

PLAN	PHASE	NEXT-PHASES	GREENMIN	GREENMAX	GREENEXT	YELLOW	REDCLEAR	GROUPFIRST	NOTES
1	1	2	35	0	0	4	0	1	
1	2	3	5	0	0	3	0	0	
1	3	4	8	0	0	3	0	0	
1	4	5	32	0	0	4	0	0	
1	5	6	9	0	0	3	0	0	
1	6	1	1	0	0	3	0	0	
2	1	2	12	30	4	3	0	1	
2	2	1	10	40	4	3	0	0	
3	1	2	12	30	4	3	1	1	
3	2	3	4	8	2	3	0	0	
3	3	1	10	20	4	3	1	0	

Table 45. Test detector table.

ID	NODE	LINK	OFFSET	LANEBEGIN	LANEEND	LENGTH	STYLE	COORDINATR	CATEGORY	NOTES
5001	14142	2753	350	1	1	3	PASSAGE	1000	PERFECT	
5002	14142	11486	250	1	3	3	PRESENCE	1000	PERFECT	
5005	14142	2752	300	1	2	3	PASSAGE	1000	A	
6001	8521	9704	3	1	1	100	PRESENCE	8521	PERFECT	
6002	8521	9704	3	2	2	100	PRESENCE	8521	PERFECT	
6003	8521	9706	6	1	1	100	PRESENCE	8521	PERFECT	
6004	8521	12407	3	1	1	100	PRESENCE	8521	PERFECT	
6005	8521	12407	3	2	2	100	PRESENCE	8521	PERFECT	
6006	8521	9705	6	1	1	100	PRESENCE	8521	PERFECT	

Table 46. Test signal coordinator table.

ID	TYPE	ALGORITHM	NOTES
1000			

Table 47. Test activity location table.

ID	NODE	LINK	OFFSET	LAYER	EASTING	NORTHING	ELEVATION	ACCESS	HOME	WORK	NOTES
23	8524	9706	200	AUTO	2000	700	1000	0.00	1.0	0.0	
24	8521	12407	300	BUS	2300	1500	1000	375.	0.0	1.0	

Table 48. Test process link table.

ID	FROMID	FROMTYPE	TOID	TOTYPE	DELAY	COST	NOTES
123	3003	TRANSIT	23	ACTIVITY	10	20	
124	24	ACTIVITY	1003	PARKING	30	40	

Table 49. Test study area link table.

ID	BUFFER	NOTES
9704	N	
9705	N	
9706	N	
11486	N	
11487	N	
11495	N	
12384	N	
12407	N	
28800	N	
28804	N	
2759	Y	
2750	Y	
2751	Y	
2752	Y	
2753	Y	
2755	Y	
2754	Y	
2756	Y	
2757	Y	
2758	Y	

Appendix B: Transit files examples

>>>>>None identified at this time.

Appendix C: Vehicle files examples

Example 1:

Household 1460 has two vehicles (500100 and 500101); both start at the home location (78) and are of network type auto (1).

The user-defined emissions vehicle subtype (10) is the same for both vehicles. The optional user-defined integer field is present in this file. One integer field is an indicator of the maintenance level of the vehicle. Note that the second vehicle (500101) has unknown/unused value (-1) for the first optional integer field.

```
  HHIO  VEHICLE  LOCATION  VEHTYPE  SUBTYPE
  1460  500100   78        1        10       30
  1460  500101    8        1        10       -1
```

Example 2:

Read all of the data in the vehicle file then write the vehicle information to another file. The data for each vehicle is stored in a `VehicleData` structure.

```
#include <stdio.h>
#include <vehio.h>

int main(int argc, char *argv[])
{
   FILE   *fp;
   FILE   *outfp;
   int    count = 0;
   const VehicleData      *veh;
   Tveh DataHeader        *header;

   if (argc < 3) {
      fprintf(stdout, “Usage:  testveh <veh input file> <output file>\n”);
      exit(0);
   }

   fp = fopen(argv[1], “r”);
   if (fp == NULL) {
      printf(“Failed to open file %s...exiting\n”, argv[1]);
      exit(0);
   }

   outfp = fopen(argv[2], “w”);
   if (outfp == NULL) {
      printf(“Failed to open file %s...exiting\n”, argv[2]);
      exit(0);
   }

VehDataReadHeader (fp, header); vehDataWriterHeader (out fp; header);
   while (moreVehicles(fp)) {
      veh = getNextVehicle(fp);
      if (veh == NULL) {
         fprintf(stderr, “Error FAILED to get vehicle...exiting\n”);
         break;
```

```
      }
      count++;
      if (!writeVehicle(outfp, veh)) {
         fprintf(stderr, “Failed to write vehicle %d\n”, veh>fVehicleId);
      }
   }

   fclose(fp);
   fclose (outfp);
   return 0;
}
```

5. VEHICLE PROTOTYPE FILE

This section describes the TRANSIMS vehicle prototype file. This file is used primarily by the Traffic Microsimulator to define characteristics common to whole categories of simulated vehicles. These characteristics include the vehicle type and subtype, its maximum velocity and acceleration, the vehicle length, and its occupant capacity. All vehicles used in the simulation must have a prototype.

5.1 File Format

Fields in the vehicle prototype file are tab- or space-delimited. The first line of the file must contain the field names.

Each line of the vehicle prototype file contains six mandatory fields:

1) the vehicle type,

2) a user-defined vehicle subtype used for emissions,

3) vehicle maximum velocity,

4) vehicle maximum acceleration,

5) vehicle length, and

6) vehicle capacity.

Table 29 describes the contents of the vehicle prototype files.

Table 50. Vehicle prototype file specification.

Column Name	Description
VEHTYPE	vehicle type, which is one of the following: 1 = AUTO 2 = TRUCK 4 = TAXI 5 = BUS 6 = TROLLEY 7 = STREETCAR 8 = LIGHTRAIL 9 = RAPIDRAIL 10 = REGIONALRAIL
VSUBTYPE	vehicle subtype, used for emissions.
MAXVEL	maximum velocity (meters/second)
MAXACCEL	maximum acceleration (meters/second/second)
LENGTH	vehicle length (meters)
CAPACITY	vehicle capacity (driver + number of possible passengers)

5.2 Utility Programs

>>>>>None identified at this time.

5.3 Files

Table 30 contains vehicle prototype library files.

Table 51. Vehicle prototype library files.

Type	File Name	Description
Binary Files	*libTIO.a*	TRANSIMS Interfaces library.
Source Files	*vehprotoio.h*	Defines vehicle prototype data structures and interface functions.
	vehprotoio.c	Vehicle prototype functions source file.

5.4 Configuration File Keys

Table 31 shows the vehicle prototype configuration file key.

Table 52. Prototype file configuration file key.

Configuration File Key	Description
`VEHICLE_PROTOTYPE_FILE`	The path of the vehicle prototype file.

5.5 Examples

Appendix C contains vehicle prototype file examples.